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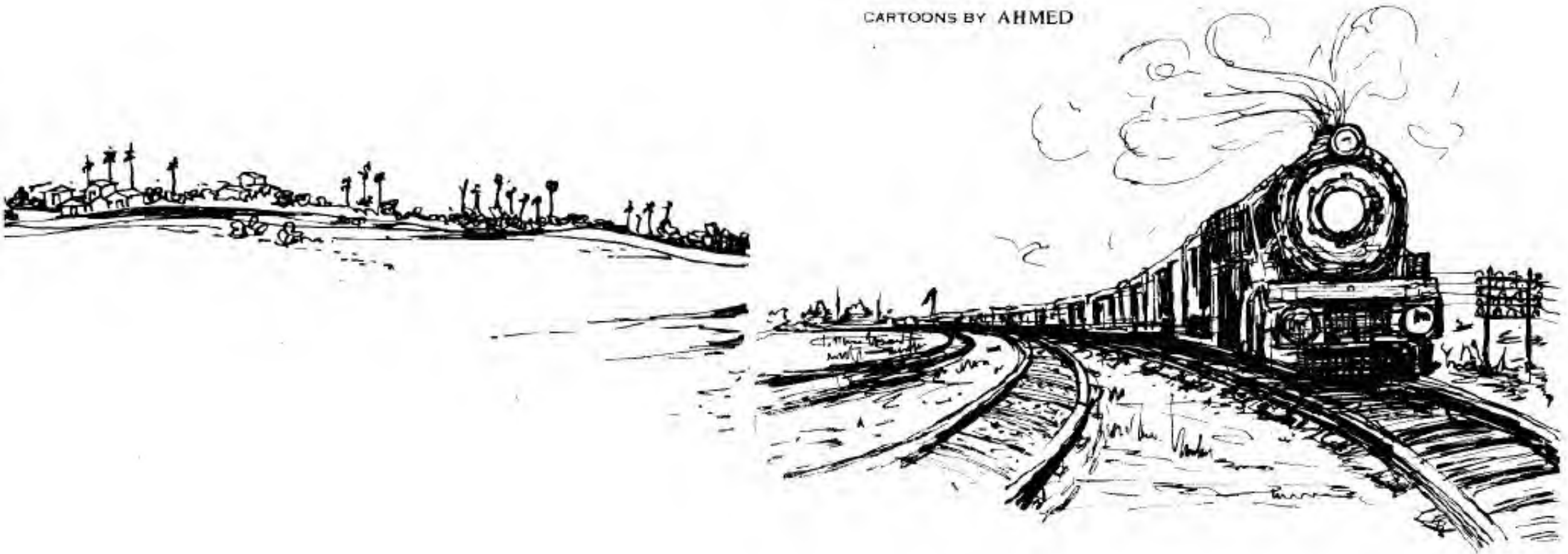
NATIONAL BOOK TRUST, INDIA

NEHRU BAL PUSTAKALAYA—9

THE STORY OF OUR RAILWAYS

JAGJIT SINGH

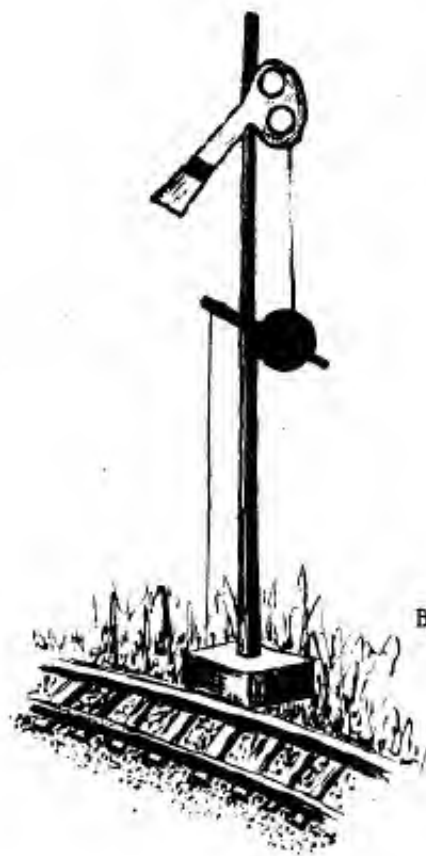
CARTOONS BY AHMED



NATIONAL BOOK TRUST, INDIA
NEW DELHI

First edition 1971 (*Saka* 1892)
Second edition 1983 (*Saka* 1905)
Third edition 1984 (*Saka* 1906)

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Photographs :

By courtesy : Railway Board

PUBLISHED BY THE DIRECTOR, NATIONAL BOOK TRUST, INDIA
NEW DELHI-110016 AND PRINTED AT JANTY PRINTING WORKS,
JAMA MASJID, DELHI-110006



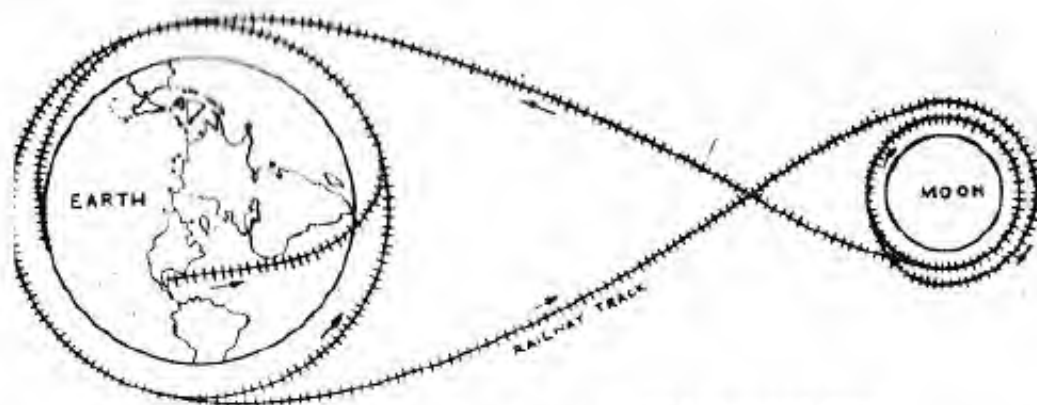
WHY RAILWAYS ?

Railways existed long before there were railway engines. When it was found that heavier loads could be hauled along a smooth track than on a rough road, the owners of coal-mines laid wooden rails along which wagons carrying coal were drawn by horses.

The earliest railway engines used steam for power. It is commonly believed that James Watt, the great Scottish engineer, was inspired to invent the steam engine when, as a young boy, he watched a boiling kettle and saw its lid being lifted by the force of steam.

Today, it is difficult to imagine a time when there were no railways. We are so used to them that we tend to take them for granted almost like the air we breathe. Yet, only 150 years ago, they did not exist. Even England, the innovator of railways, did not begin building them until 1825.

In the last century and a half, the railways have expanded enormously. Today, the total number of kilometres covered by railways in different countries exceeds 1,232,000—considerably more than the distance covered by the



TOTAL RAILWAY TRACK MORE THAN
THE DISTANCE COVERED BY ASTRONAUTS

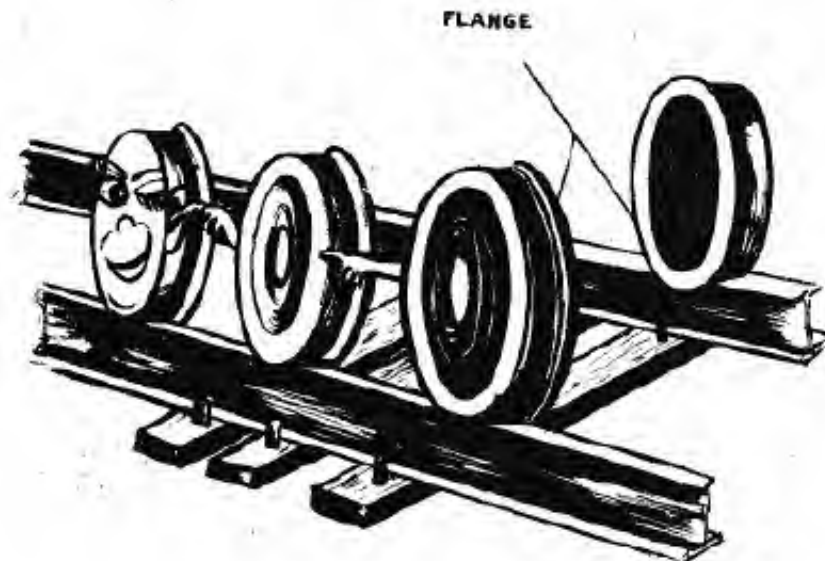
American astronauts who recently landed on the moon. And the total distance travelled by all the railway trains in the world in one year is greater than the distance from the sun to Pluto, the outermost planet of the solar system, *and back*.

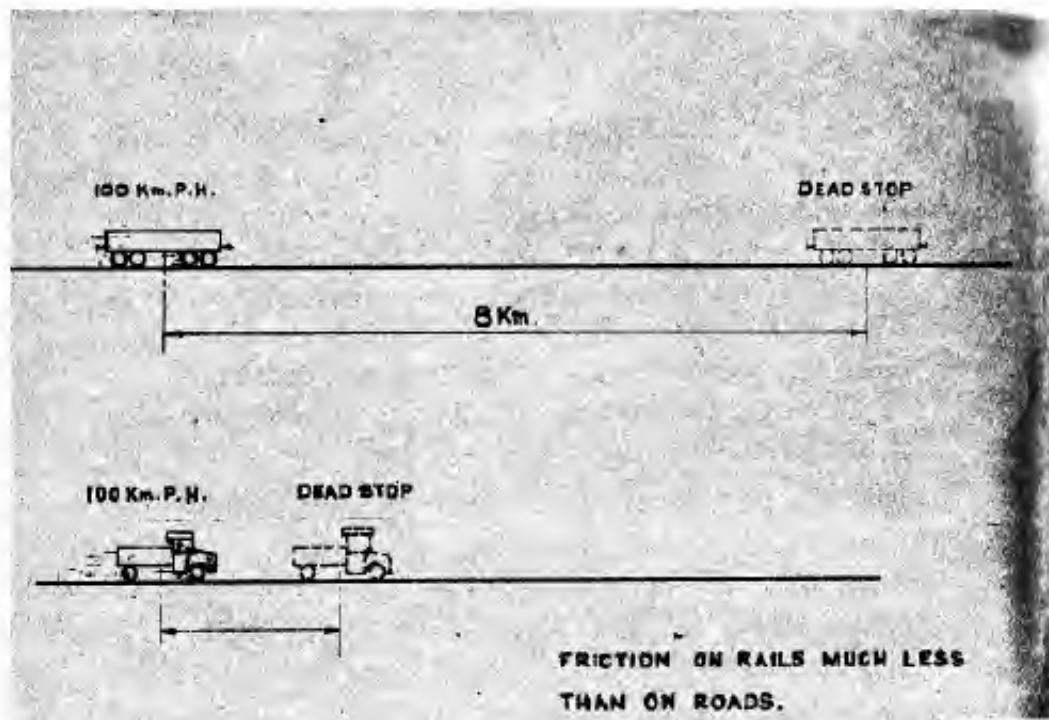
The reason for this rapid expansion of railways is that they provide the cheapest form of land transportation.

It is the type of wheels and the type of track railways use which make them so cheap. The wheels are flanged. They have an inner rim which helps to guide the vehicles along the track. Because of this, and because railway tracks are always so straight and smooth, friction between the wheels and the track is much less than that between the rubber tyres of a truck and the road. If a train

were set rolling on a level track at 100 km per hour, it would travel at least eight kilometres before coming to a stop. In contrast, a highway truck, set rolling on a road at the same speed, would only travel about 1.5 km. The low rolling friction of a train and the self-guiding characteristic of its wheels mean that a train can pull much heavier loads using much less energy than any other form of transport.

This is why even though trains pull much heavier loads than trucks, they use much less fuel. In 1964-5, for example, all other forms of transport used eight times as



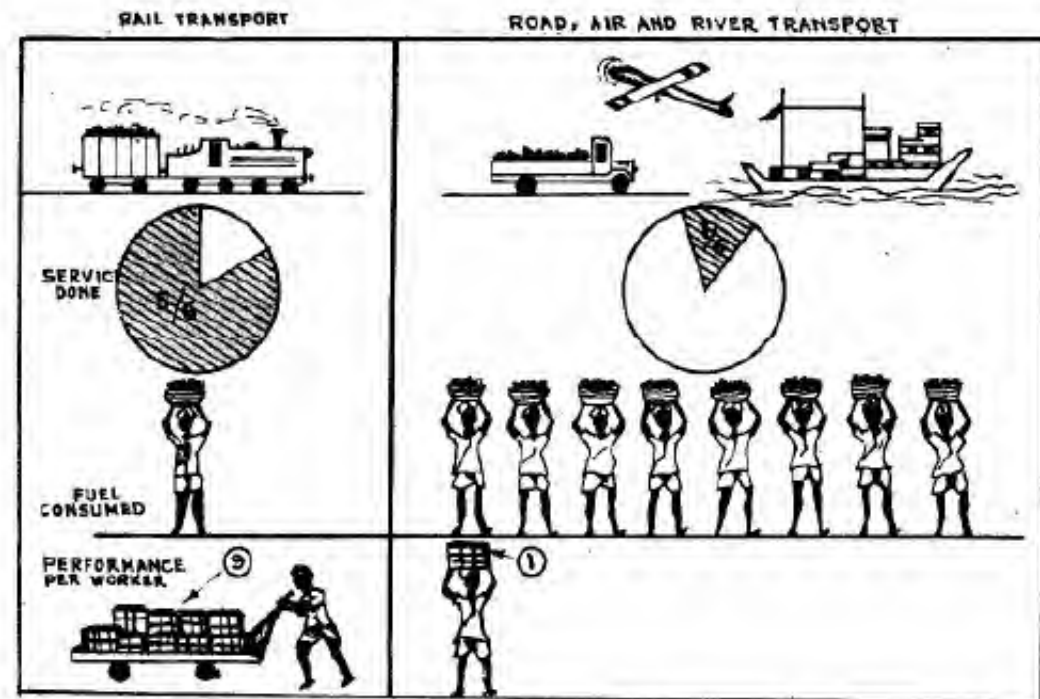


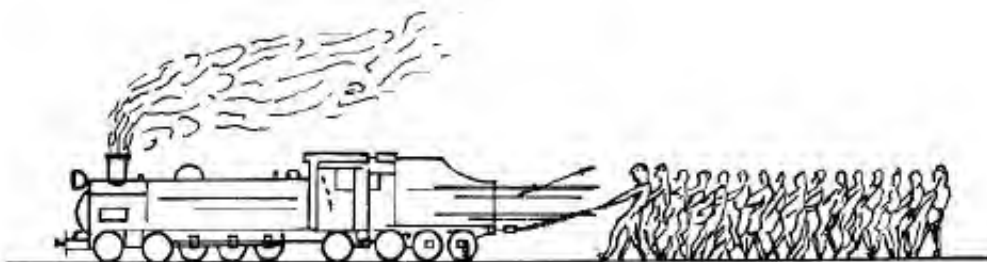
much fuel as did the railways and yet they provided about one-sixth the transportation service. Besides, for the same amount of goods carried, other forms of transport had to use nine times as many men as the railways. Railways are clearly the cheapest form of transport.

It was because the railways were so economical that the Industrial Revolution progressed so fast. The Industrial Revolution began about 150 years ago in England with the invention of the steam engine. The invention gave that country the strength and wealth to dominate much of the world, including India, for some time. It was as if England had acquired all of a sudden an army of millions of inanimate slaves to sweat and toil for her, without her

having to feed or clothe them. One steam engine of 500 horse-power is equivalent to a force of about 10,000 men. So the work of a million men can be done with only 100 steam engines.

In the beginning these mechanical slaves, the steam engines, took over the prevailing handicrafts like weaving and spinning. In order to produce more goods, more raw materials had to be moved to the factories. And the finished goods then had to be moved to the markets for sale. So there had to be a cheaper and more efficient form of transport to and from the factories. This was where the railways came in. Their advent was a great spur to the progress of human civilization. Because of their power to move mountains of minerals like coal and ores, the





ONE ENGINE OF 500 H.P. = 10,000 MEN

railways soon became the mother industry that nursed steel plants and thermal power-houses, the key industries of the first half of the twentieth century.

We still think of the richest country in the world as the one which can produce most steel and electricity. It was natural that Nehru, when he set about building our country after Independence, gave most importance to steel, electric power and the railways. Without the railways, steel and electric power could not have developed, and India would have remained technologically backward.

TRACK AND TRACTION

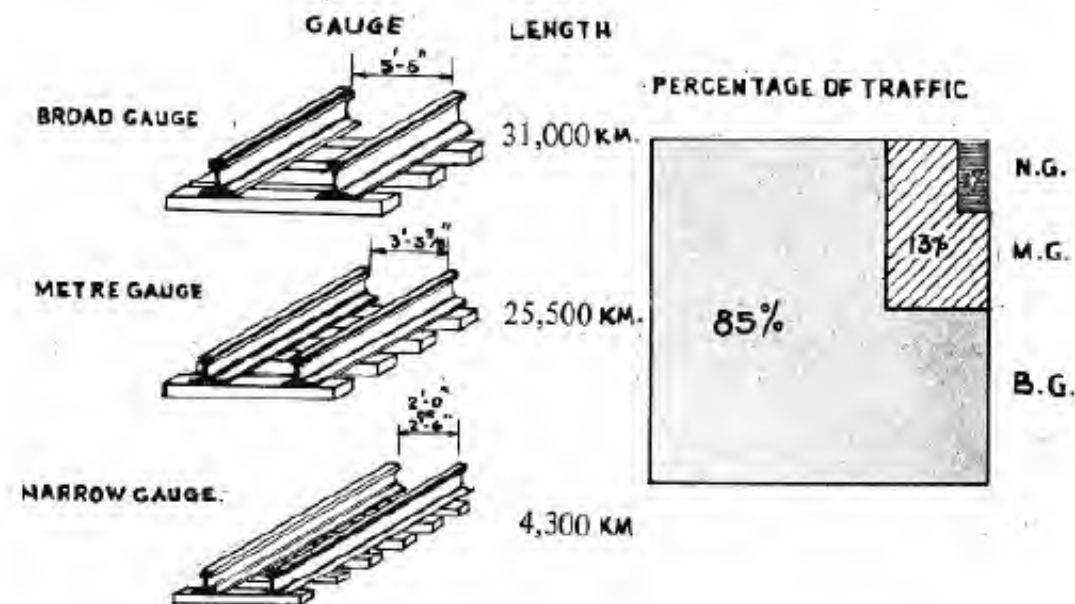
Almost every place in India, except perhaps the foothills of the Himalayas and some underdeveloped areas, is within 30 km of a railway line. If you take a train at Amritsar, the northernmost rail terminus near the border of West Pakistan, you can reach Calcutta in the east, Cape Comorin in the south and Bombay in the west. Railways have to cover the whole country as they are an essential part of any modern society.

In any train journey that you make, you may have to change trains at a junction. This may be merely because the first train does not happen to be going where you want. But it may also be because of a change in the width of track. In this case, you have to take another train because the train cannot change tracks.

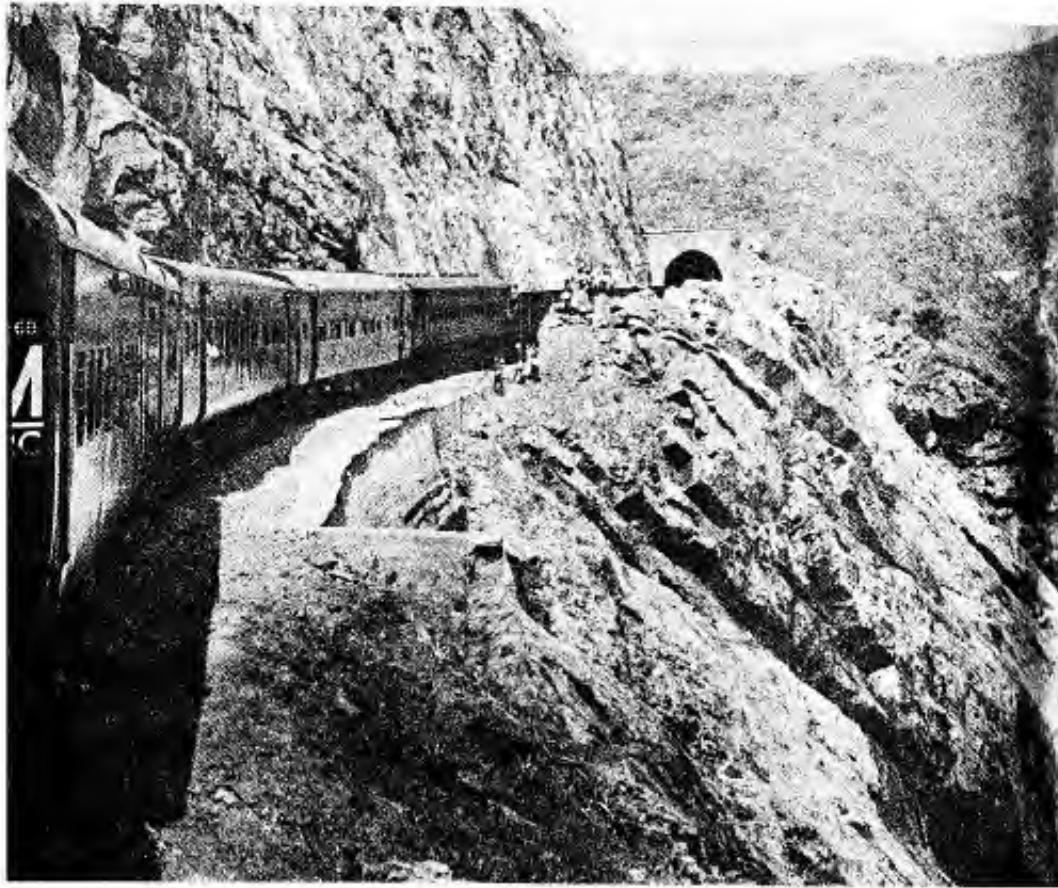
On our railways we use three different widths of track. The widest, which is 1.68 m, is called broad gauge. Then comes metre gauge, which is simply a metre wide. The smallest is 0.61 m or 0.67 m wide, and is called narrow gauge. Most tracks are in broad gauge or in metre



The three different widths of tracks



gauge. Out of 60,800 km of railway tracks in India, 31,000 km are in broad gauge and 25,500 in metre gauge, and only 4,300 are in narrow gauge. Although the kilometerage of broad gauge is only 25% more than that of metre gauge, the bulk of the traffic—85% of all goods and passengers—is carried on broad gauge. Narrow gauge carries a tiny 2%.



The chief advantage of narrow gauges is that they allow the line to follow sharper curves so that in mountainous country there is less need for cuttings, tunnels, embankments and bridges. The broader the gauge, however,



Firing an engine

the greater the loads that can be carried. Broad gauges help towards faster and more comfortable travel.

Most of the locos that run on our tracks are steam engines and use coal. There are two other kinds of locos, however, which run on diesel oil and electricity.

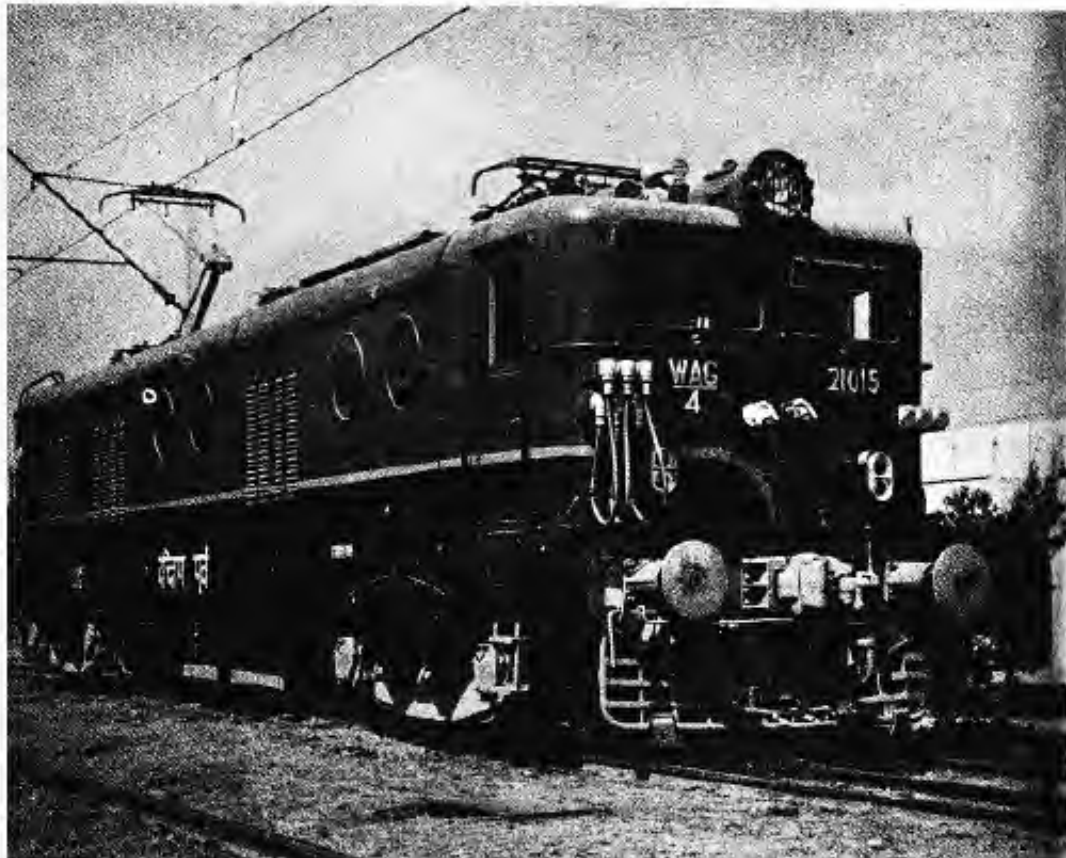
TABLE I

Number of Locomotives on the Indian Railways

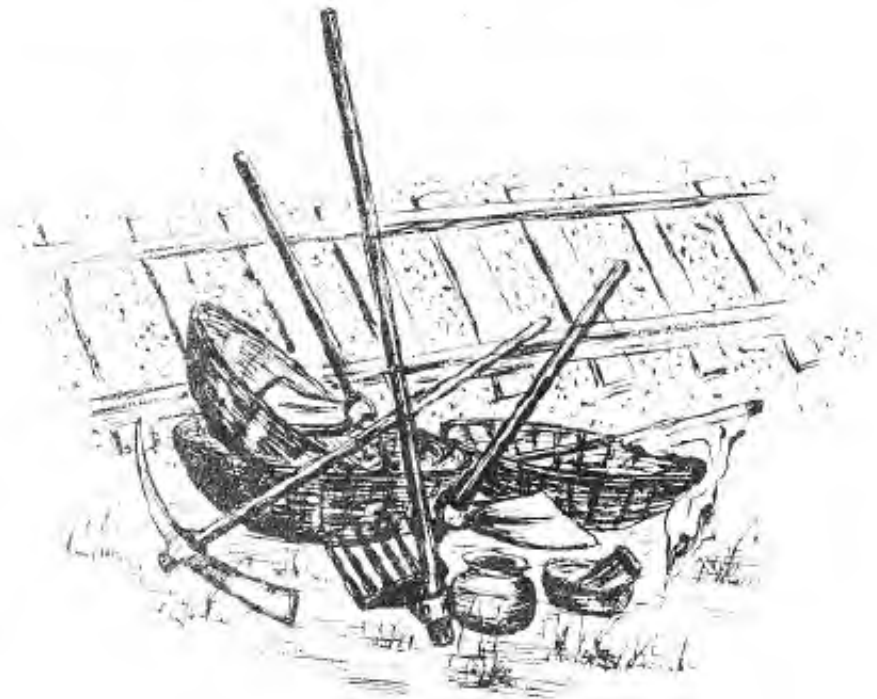
	Broad Gauge	Metre Gauge	Narrow Gauge	Total
Steam	4302	2653	341	7296
Diesel	1958	488	69	2515
Electric	1084	20	—	1104
	<u>7,344</u>	<u>3,161</u>	<u>410</u>	<u>10,915</u>

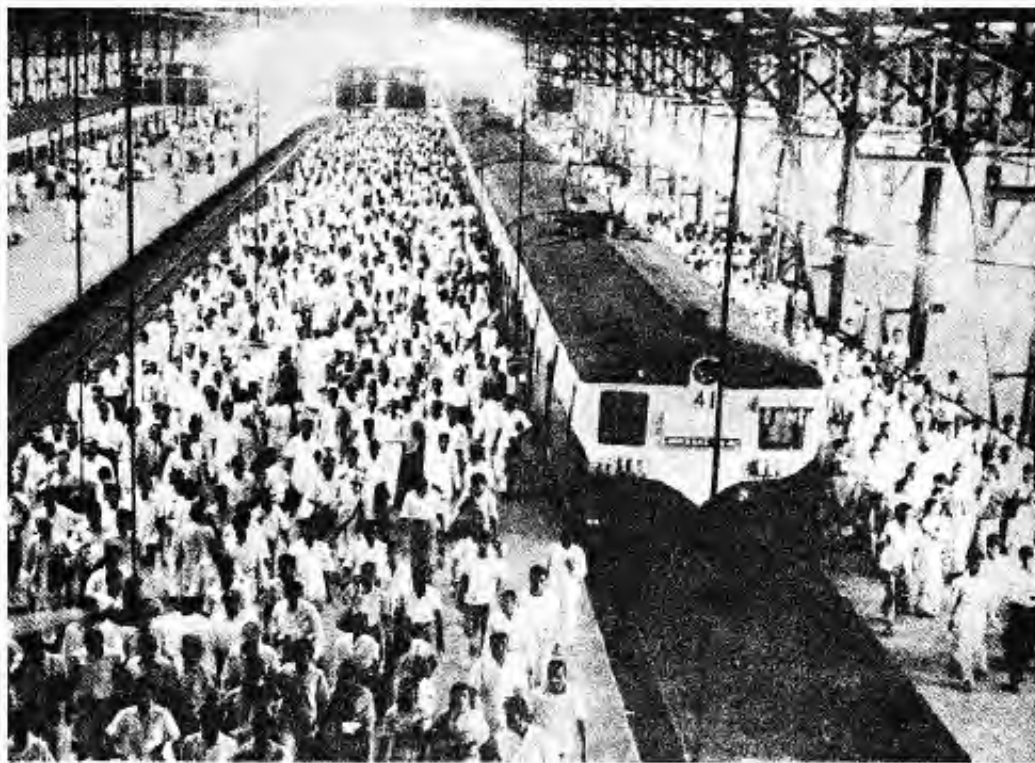
In the next ten years, we hope to increase the number of diesel and electric locomotives, as they are much more economical

An electric loco built in India.



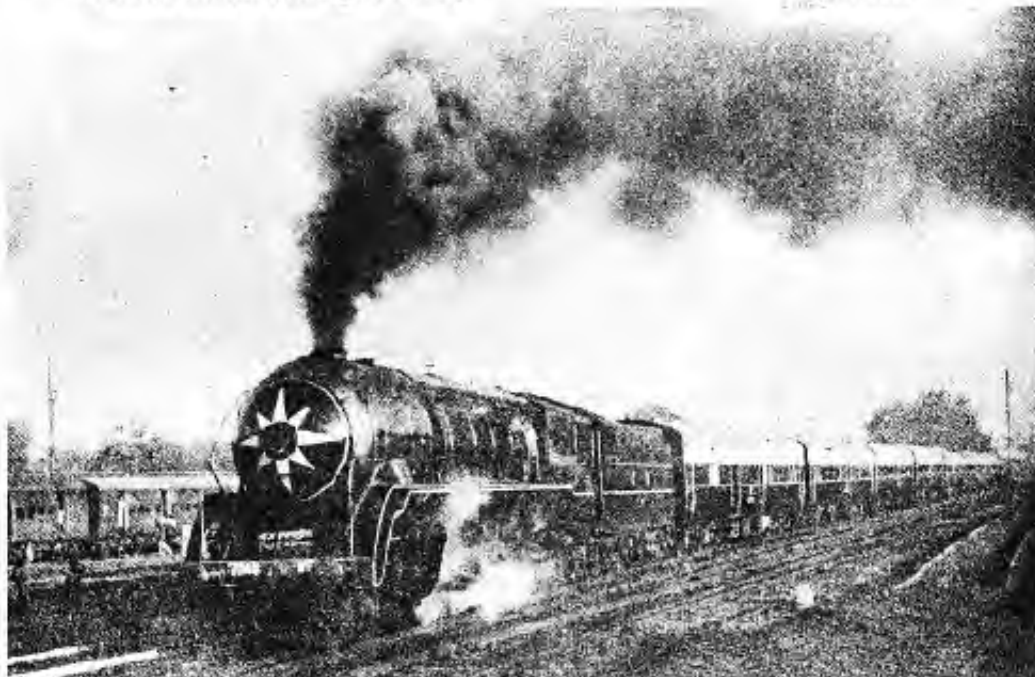
than steam locomotives. They can be worked harder, faster and for longer periods, without interruptions like watering or coaling, which are necessary for steam locomotives. The replacement of steam locomotives by diesel and electric locomotives is part of the programme of modernization of the Indian Railways. As we shall see in the fourth chapter, the Indian Railways have already modernized many suburban services as well as some major trunk routes.





Peak-hour traffic at Churchgate, Bombay

Taj Express



RAIL TRANSPORT AND NATIONAL ECONOMY

When you travel as a passenger on the railways, you see only a tiny fraction of the total railway service. Rail transport is like an iceberg. For every molehill of service you see above the surface, there is a mountain of it underneath. What you see above the surface is only the passenger service. But below the surface is the vast mass of freight transport. It is freight transport that is the bread and butter of the railways for it, rather than passenger service, earns most of the money and is important for the national economy. This is not peculiar to India. It is the universal rule throughout the world.

In India, the nation owns the railways. But in other countries of the world, for instance, in America, railways are often owned by private companies. Because freight transport is a much more profitable business than passenger service, many of these private companies do their best to discourage the passenger. By law, they have to provide a passenger service. But they make it as uncomfortable as possible, in order to concentrate on the more lucrative



business of freight transport. This may not seem very fair. But for the owner of the private railroad company all is fair in the business game. If he cannot make money in his line of business, he will want to close it down rather than continue suffering a loss. If the law comes in his way and requires him to continue the service, he can at least claim that passenger travel was not the reason why railways were invented.

As we saw in the first chapter, without the cheap and reliable transport of bulk goods that only railways could provide, the Industrial Revolution would never have been realized. When India started to plan its economic growth after Independence, it was inevitable that the development of railways should play a key role.

Indian Railways have played a central role in the development of the country. We can see this by considering the growth of railways with the development of steel in the south-eastern region. The Second and Third Five-Year Plans gave top priority to the development of steel. Two new steel plants were located at Rourkela and Bhilai, and the two old ones at Jamshedpur and Burnpur were made to double their capacity. This led inevitably to a tremendous growth of the South Eastern Railway. Before the expansion of these steel plants, an average of 2,500 goods wagons were loaded every day. We now have to load a daily average of 12,000 wagons. You can see how rapidly the South Eastern Railway has had to grow in order to keep up with the development of steel.

The same is true of the Indian Railways as a whole. The

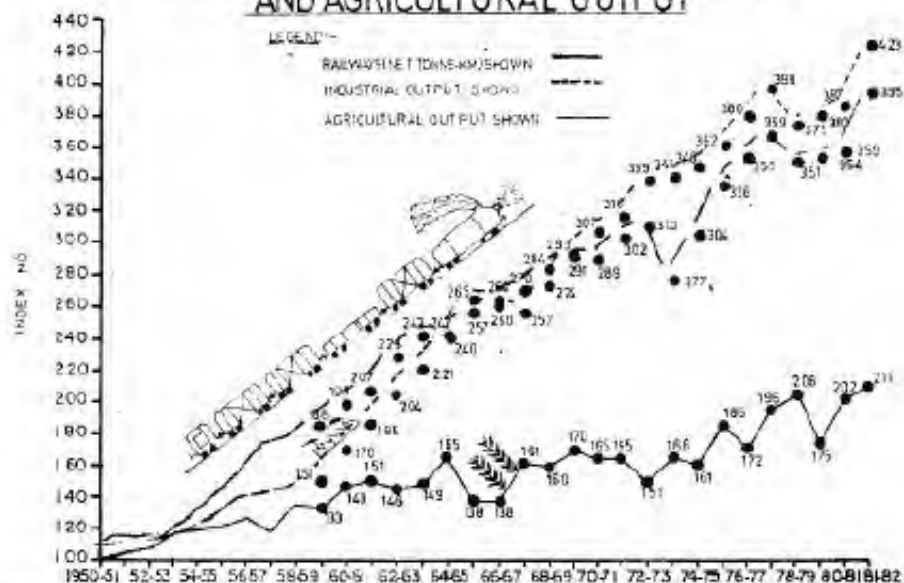
growth of railways has been an essential part of the development of the country. In 1950-1 the volume of freight carried on the Indian Railways was 44 billion tonne-km (the total number of tonnes multiplied by the number of kilometres the goods were carried). In 1981-82 this rose to 174 billion tonne-km. This is a growth of 395% ($=174/44 \times 100$) over a period of 31 years.

If you look at the diagram you will see how well the railways have kept up with developments in agriculture and

RAILWAYS KEEPING UP WITH INDUSTRIAL AND AGRICULTURAL OUTPUT

LEGEND:-

RAILWAY NET TONNE-KM SHOWN
INDUSTRIAL OUTPUT SHOWN
AGRICULTURAL OUTPUT SHOWN



RAILWAY NETWORK AND BLOOD CIRCULATION SYSTEM

industry. In this diagram, the annual amount produced (or carried by the railways) is calculated as a percentage of the amount produced in 1950-1. Thus, in 1981-82, industrial output had increased by 295% since 1950, agricultural output had increased by 111%, and railway transport by 323%. This just shows how well the railways have kept up with other sectors of the national economy.

The railways *have* to be expanding continually if industry and agriculture are to develop. Railway transport is like the blood circulation system in the human body. It gives life to the national economy by allowing goods to flow from one part of the country to another. And just as all sorts of ailments arise in the body if the blood circulation slows down, so all sorts of economic ailments arise if railway transport goes awry. No wonder that, despite all the technical advances of today, the railways have held their own, not only in India, but also throughout the rest of the world. Of course, they have had to be modernized, but nowhere have they been rendered obsolete.

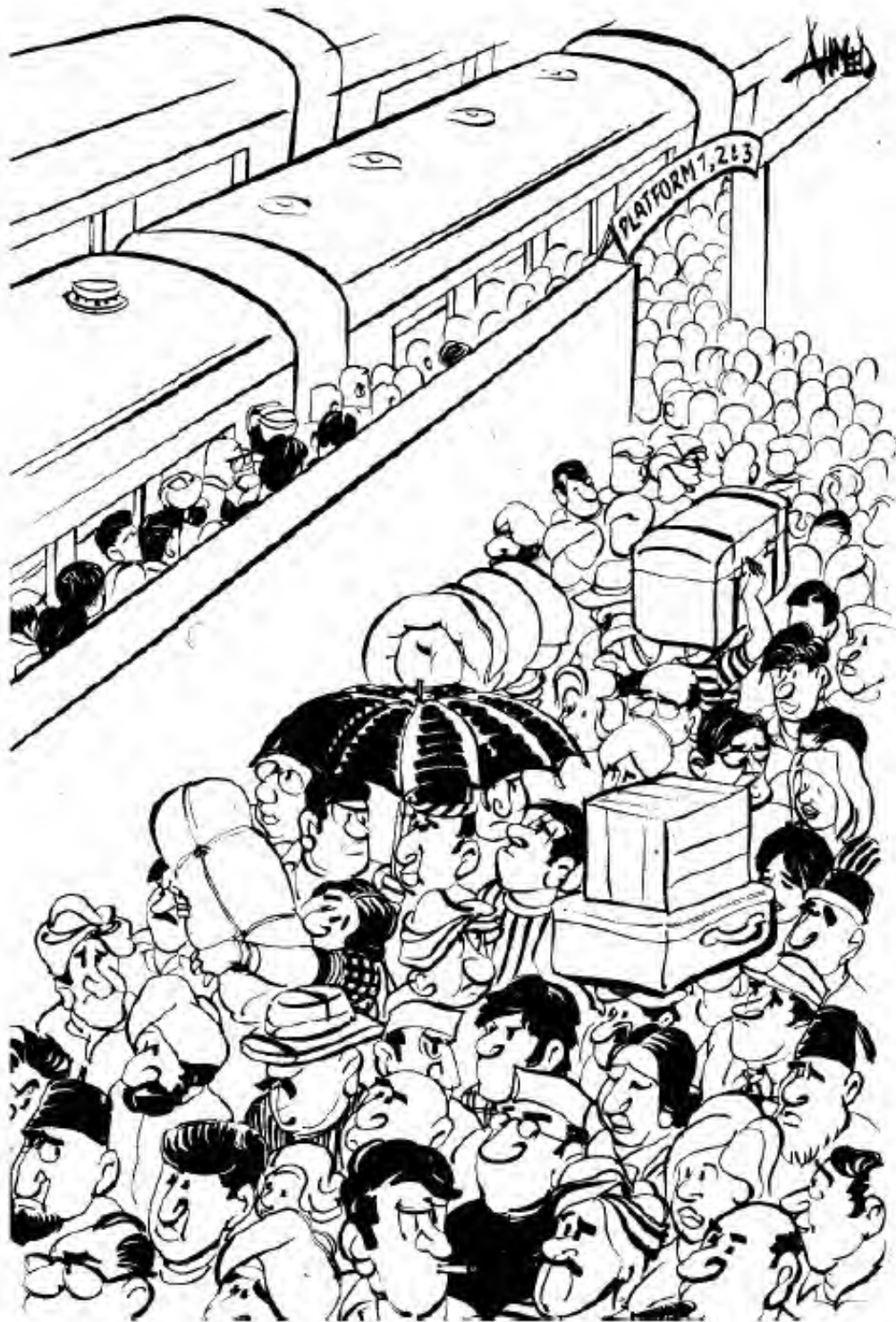
Even advanced countries like Japan, Germany, the U.S.S.R., the U.S.A., and Great Britain have not been able to do without them. Their citizens have had to pay heavily for their modernization.

SUBURBAN RAILWAYS

If you live in one of the large metropolitan towns like Bombay or Calcutta, you probably have to take a train to reach the centre of the town. In fact, lakhs of people travel to and from their places of work and homes every day by suburban trains. Consequently, the suburban service has to be much faster and cope with many more people than the ordinary passenger service.

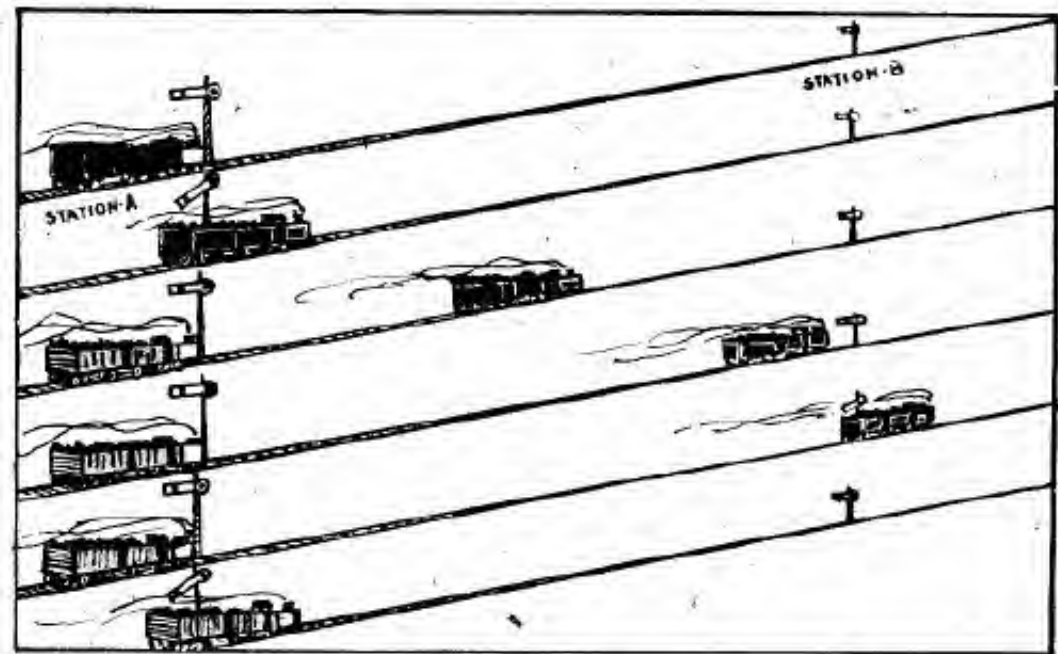
Suppose 1,00,000 people go to work every day by suburban trains, and they travel in the rush hours, between 5 a.m. and 10 a.m. in the morning. That means 20,000 people must be carried every hour. One tightly packed train will take about 1,000 passengers. So we have to run 20 trains an hour to cope with all the passengers, or one train every three minutes. This is a very dense service. With steam traction and the normal mode of train working, it is impossible to provide such service, even on a double line.

The normal mode of working trains is called in railway jargon 'Absolute Block' working. In the Absolute Block System, no train is allowed to leave station A for the next



station B, unless the line between A and B is clear. As soon as one train arrives safely at station B, the news of its arrival is conveyed to station A so that the next train can proceed towards B. This is a necessary safeguard to prevent trains colliding midway between the two stations A and B. The need to keep two following trains so far apart is this. In the first chapter we saw that trains were more economical than highway trucks, because of the low rolling friction between the rail and the flanged wheel. But like everything else in life, it has its disadvantages too. It takes a much longer distance to stop a train moving at full speed.

If trains have to work under the Absolute Block System, a frequent train service between A and B cannot be



STARTING
SIGNAL

ABSOLUTE BLOCK
SYSTEM

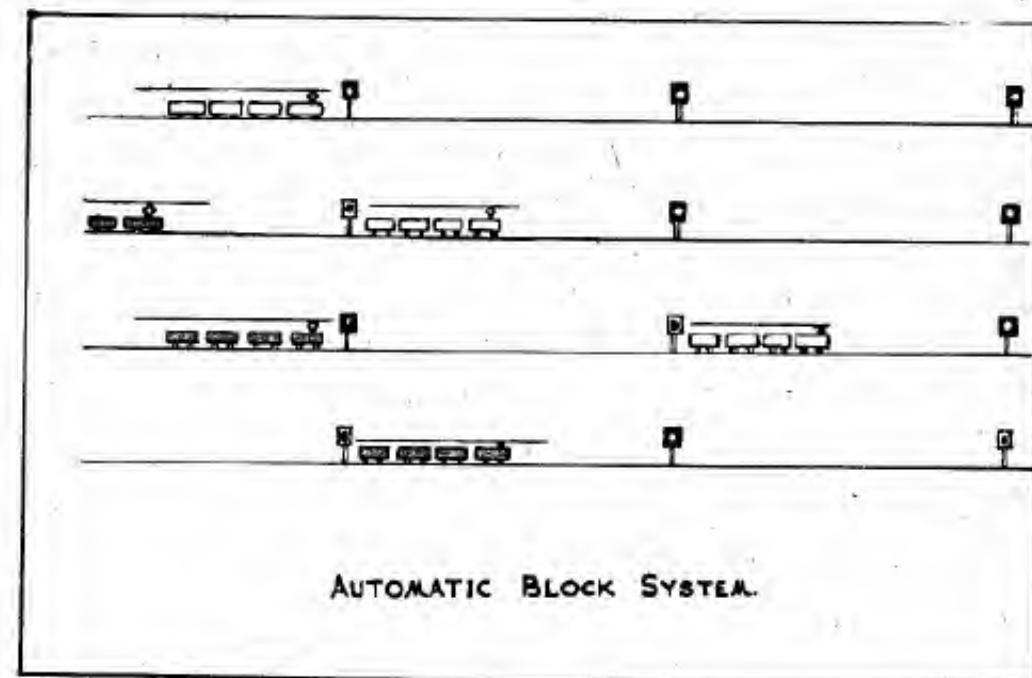
RECEIVING
SIGNAL

provided. It also takes comparatively longer for a steam train to pick up speed or to stop. So if the stations A and B are only three or four km apart, as is the case on a suburban railway, it is impossible for a steam engine to pick up its maximum speed, for soon it has to stop again. In fact, it can be shown that under steam traction and Absolute Block working, the gap between successive trains can never be less than ten or twelve minutes. This is no good for suburban services.

One way of solving the problem is to electrify the suburban lines. Electric trains can accelerate up to 100 km per hour within the length of one platform, and they can stop from the same speed in the same distance. This is an immense improvement. If A and B are stations three km apart, an electric train can travel the distance in a couple of minutes, and be away from B within three minutes, after picking up more passengers. The first step, then, in the improvement of service on suburban lines, is to electrify the entire track.

There is a second step which is just as important. Under the Absolute Block System it takes two or three minutes for a man at B to tell A that the next train can proceed—even if everyone is alert and the call goes through immediately. So another way of speeding up the service is to make the signalling automatic. As soon as a train arrives at B, the news is conveyed to A *automatically*.

For a suburban service, trains have to be electrified and the Absolute Block System has to be made automatic, in order to cope with increased frequency in traffic.



Recently, the whole of the Calcutta suburban section was modernized in this way.

It is not only suburban trains that have to run at frequent intervals. There are some sections of trunk routes of the railway which have an almost equally high frequency of traffic as a suburban station. Such a section of the railways is the Grand Chord Section of the Eastern Railway from Gomoh through Gaya to Mughalsarai. As this route is the main artery through which flow the

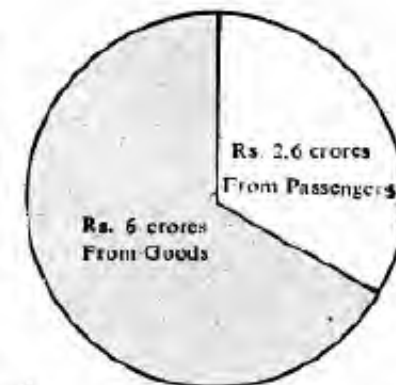
products of coal-mines and steel mills of Bengal and Bihar to Northern and Western India, it has to run some 40 freight and seven passenger trains either way every day. Since some time has to be allowed for maintenance of track*, the frequency of service is very dense indeed. At any given point of the track on the Grand Chord, there is a train passing every 20 minutes or so. So far as I know, it is among the most densely used trunk railway lines in the world.

*To save time for train running purposes, track maintenance in the section has had to be mechanised by using Tie Tamping Machines. Even so, it is uneconomical to use them unless a four hours' 'block' period is allowed to work them. 'Block' is railway-men's jargon for temporary suspension of train running for track repair and maintenance.

Tie Tamping Machine



In order to modernise such sections by electrification and automatic signalling, an immense amount of money has to be spent. The railways have been investing in numerous such improvements every year. As a result, the amount of money invested has become very large.



DAILY EARNINGS OF INDIAN RAILWAYS

This is why the railways today are the nation's largest undertaking, with an investment of Rs. 8,164 crores and employees numbering 1.5 million in 1981-82.

The Indian Railways have a fleet of about 10,815 locomotives, 38,160 passenger carriages and 400,000 goods wagons. About 10,000 trains are run daily to serve nearly 7,300 stations.

More than ten million passengers travel by rail *every day* (i.e., more than one person in every hundred). Every day over two-thirds of a million tonnes of goods are lifted from our factories, workshops, mines, farms, etc.

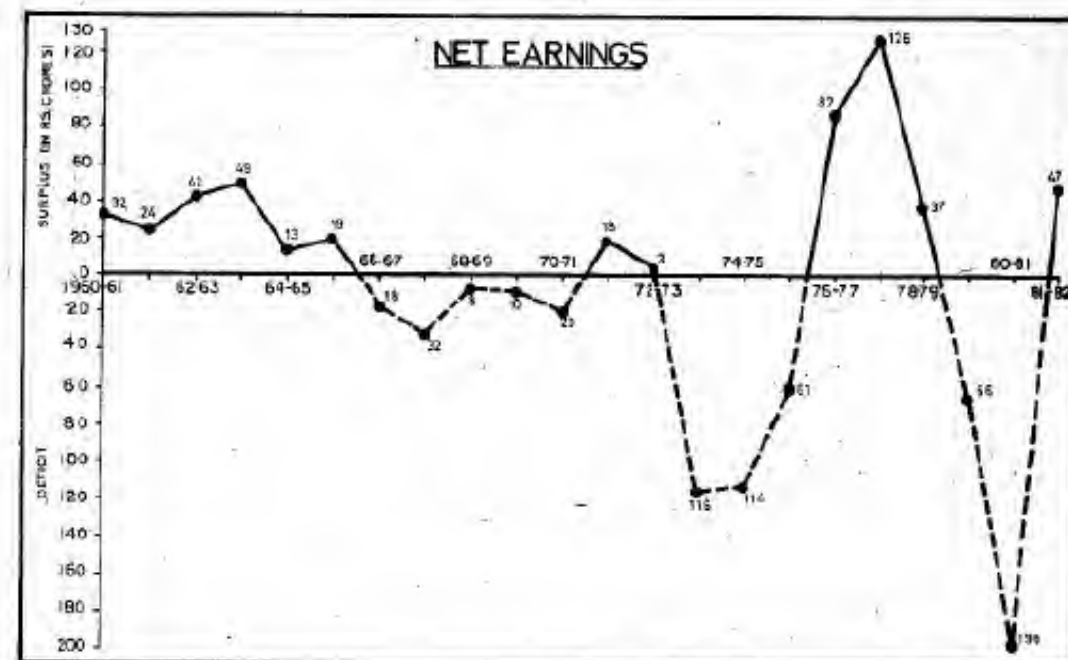
Every day some 34,000 wagons are loaded and the total daily gross earnings from these transactions amount to Rs. 8.6 crores—Rs. 2.6 crores from passengers and Rs. 6 crores from goods traffic.

THE RAILWAY BUDGET

Indian Railways are owned by the Government and are the nation's largest undertaking. Such a vast undertaking is, naturally, expected to earn its keep. It cannot be supported by the taxpayer in the same way as he supports the army, the police or the judiciary. To emphasize this special obligation of the railways, the Railway Budget is separated from the General Budget.

Every year, the Railway Minister presents the Railway Budget in Parliament a few days before the presentation of the General Budget by the Finance Minister. The keynote of the Railway Budget is the balance-sheet for the previous year and the estimated earnings and expenditure for the coming year. The most important question is whether the railways have been able to maintain themselves.

Until 1965-6, our railways lived up to this expectation. Every year before 1965 they made a modest profit after meeting all their expenses. But after that fateful year, they began to show a deficit. The deficit was not much.



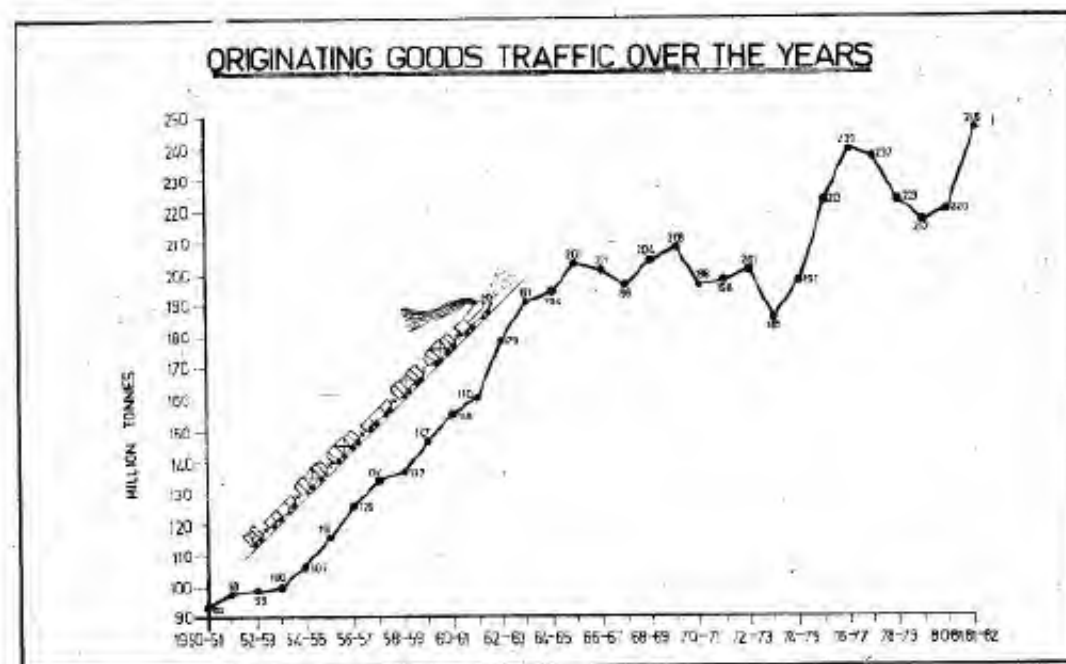
But it was a loss, not a profit. For railwaymen, this was a catastrophe. For two decades since Independence, the Indian Railways had had the distinction of being almost the only railway in the world which earned its keep. What had happened in 1965 to cause this sudden reversal?

The year 1965 was a fateful year in our economic history. It was the year of the Indo-Pakistan armed conflict. Although the fighting lasted only three weeks, it had very grave economic consequences. It affected the whole economy of the country.

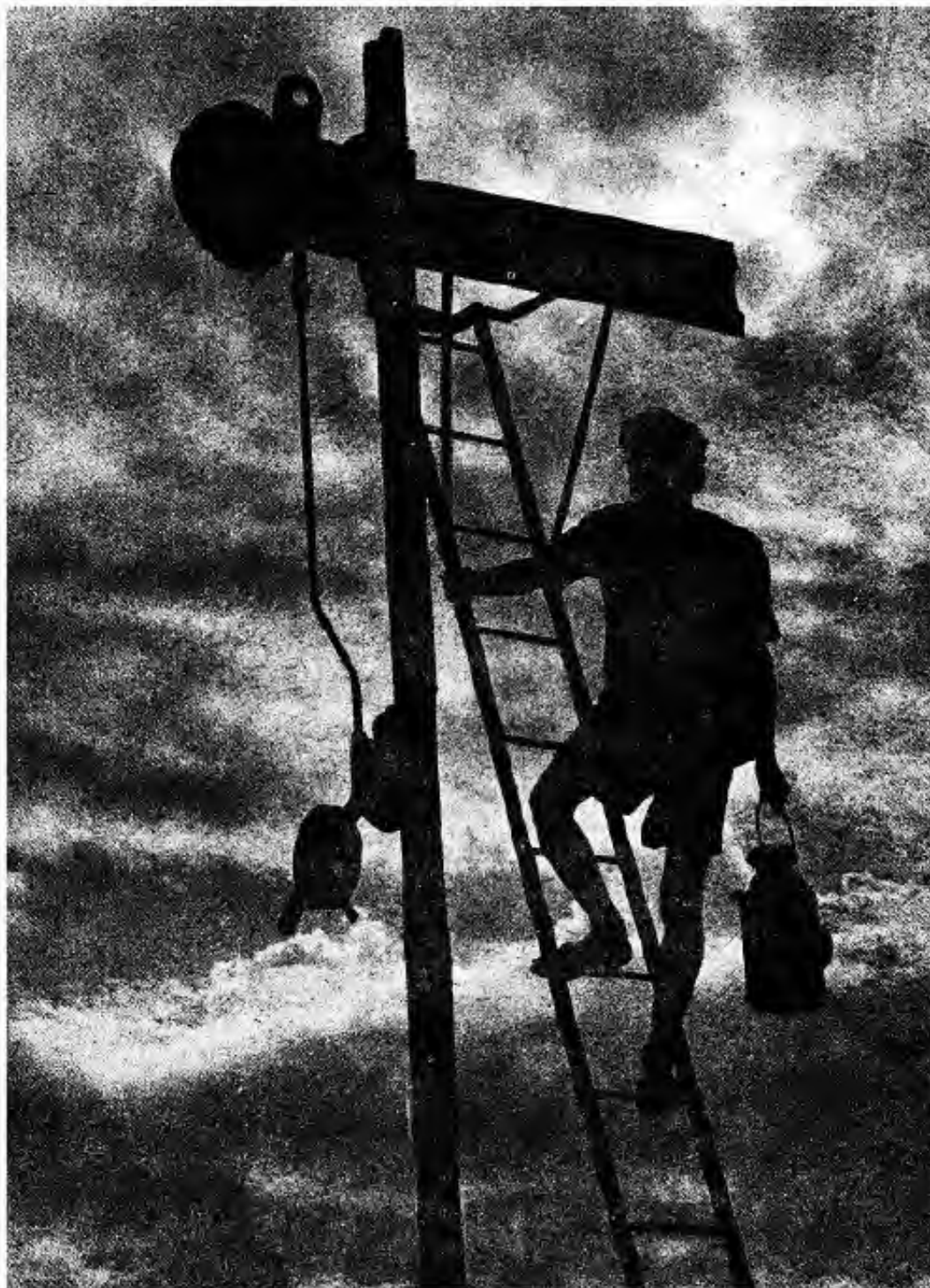
The Indo-Pak conflict was not, however, the only reason why the railways failed to make a profit after 1965. In the summer months of 1966 and 1967 there were two successive droughts of terrible severity. Both agricultural and industrial production dropped. The Government had to shelve the Fourth Five-Year Plan. This was a disaster for our growing economy. There was what economists call an industrial recession: industrial production slowed down and business, throughout the country, shrank.

The effect of the industrial recession on the Indian Railways was an immediate shrinkage of business. Since the industries were producing fewer goods, the railways had less freight to carry. As I have said so often, freight transport is the railways' main source of revenue. So naturally, with the industrial recession, the railways suffered a great loss of revenue.

The 30-odd years since the beginning of our economic planning may be divided into two almost equal parts. During the first three Five-Year Plans (1950 to 1965) the volume of goods traffic increased steadily. In 1965-6 the railways lifted 203 million tonnes compared to 93 million tonnes in 1950-1. But in 1966-7, because of industrial recession and the shelving of the Fourth Five-Year Plan, the railways were able to lift only 201 million tonnes. Thereafter, the tonnes lifted remained roughly at the 1965-6 level. What this really means is that the growth of freight transportation reached its peak during the Third Plan. The railways did recover some-



what during the three years 1975-6 to 1977-8. Then their performance began to decline again. It continued to decline till 1980-1 and was revived only in 1981-2 with the railways lifting an all-time record of around 246 million tonnes. It is hoped that the upward swing will be sustained and India's industrial growth is not adversely affected for want of adequate rail transport. For, the railways even today, are to India almost what they were to Victorian Britain—not just one, but the only lifeline of commerce and industry.



THE RAILWAYS IN WAR

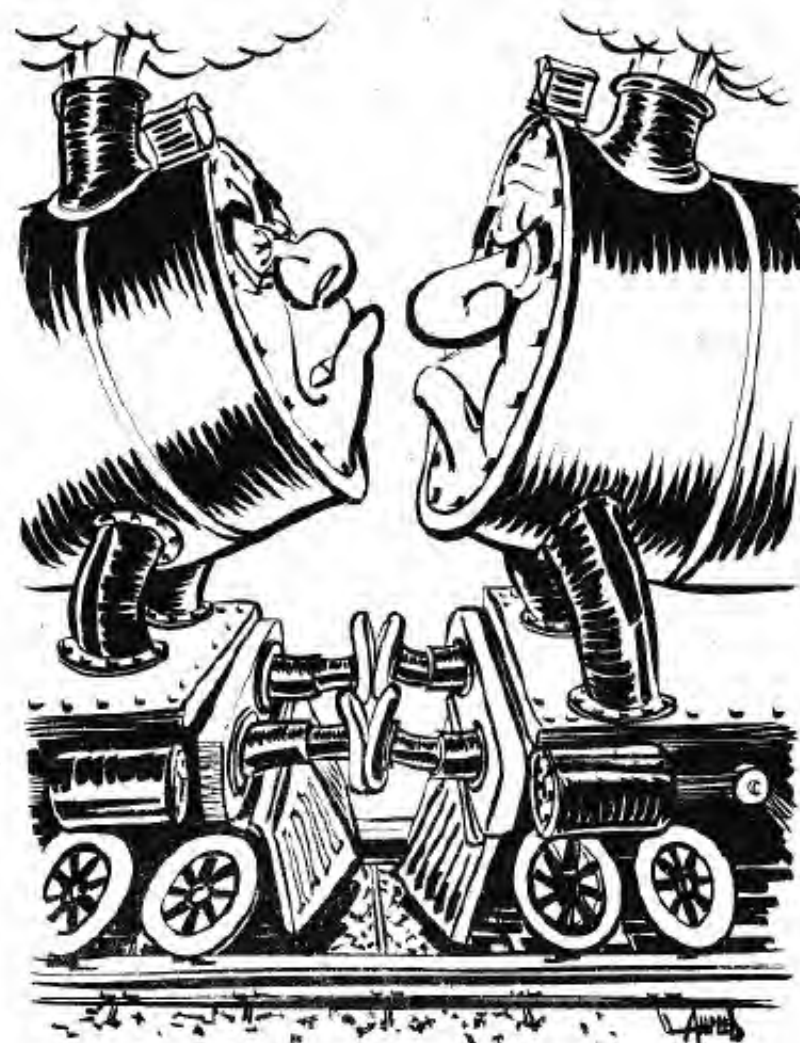
An immediate result of the Indo-Pakistan conflict of 1965 was the interruption of traffic on two independent supply lines to the north-eastern region. Prior to that year a sizable fraction of freight supplies to North Bengal, Assam, NEFA, Tripura and Nagaland was carried on two independent routes—one by rail and the other by river—both of which ran through East Pakistan. The Indian Government had a trade agreement with Pakistan which enabled it to use these two routes for the movement of goods to and from the north-eastern region.

In 1965, both the supply lines through Pakistan were blockaded. We were no longer able to send our supplies through East Pakistan. The whole of the jute and tea traffic was disrupted. It was essential for supplies to continue to and from the north-eastern region. The Indian Railways had immediately to find a way of increasing the capacity of their own all-India route to carry the additional traffic. But this posed a serious problem. For, our own railway route was already being used to its full capacity.

It was indeed a formidable task. Nevertheless, Indian railwaymen, with a zeal they are accustomed to show in emergencies, managed to create overnight the additional capacity required. How did they do it? Goods traffic is carried by goods trains hauled by diesel engines. To carry more traffic, more trains have to be run. More trains require more engines. But more engines could not be procured at short notice. So the railways adopted a new device whereby each engine did more service than before. By February 1966 each goods train diesel engine was yielding an average of 294 kilometres a day, 90 kilometres more than six months previously.

How did the railways manage to extract more service from its fleet of diesel engines? It was really very simple. Nearly all the railway network in our north-eastern region is single-line. When you run trains on a single-line section, trains running from opposite directions must cross at intermediate stations. The situation is very similar to that on some hill sections like the road to Badrinath on which you may have travelled. Because of the difficult terrain, the road is too narrow to allow the crossing of two cars coming from opposite directions. In such cases all cars going uphill are held up at a "gate" till those coming down have arrived. For exactly the same reason, trains running from opposite directions on a single line must cross at some intermediate station. For if not, they will deadlock in mid-sections even if they manage to avoid a head-on collision.

For this reason, you have to be careful while increasing



the number of trains on a single-line section. The more the number of trains, the more the crossing delays. Very soon a stage is reached when the addition of even a single train practically stops all movement. This happens because so many trains now begin to wait for others to pass, that very few actually move. In fact, the line becomes so congested that it carries *less* freight than before. Now the single line in the north-eastern region at the time of the Indo-Pak hostilities was already running as many trains as it could accommodate. Additional trains would therefore have led to more congestion, not more movement. There was a neat way out of this dilemma, namely, how to carry *more* freight without increasing the number of trains running on the system. Instead of increasing the number of trains, two passenger trains were coupled together and run as a single unit. In this way there was no congestion, but there was an increase in the amount of freight carried.

In fact, the additional freight-carrying capacity was achieved with an actual reduction in the number of metre-gauge wagons. Two thousand metre-gauge wagons, worth about Rs. 2.5 crores, were taken away from the North-Eastern Frontier Railway and presented to the other railways. In this way, the production of other regions of India was increased. For instance, many wagons were used for loading and unloading foodgrains at Kandla, in the western region.

SAFETY ON RAILWAYS

At the opening of one of the earliest railway lines in the world, the Liverpool-Manchester Railway in England, the driver of the inaugural train ran over and killed the V.I.P. who was to open the line! Since the death of William Hutchinson, the British Cabinet Minister, on that fateful day, September 15, 1830, a major concern of railways throughout the world has been with safety. "Safety First, Safety Second, and Safety Always" has been their motto, for the past 140 years of the railways' existence.

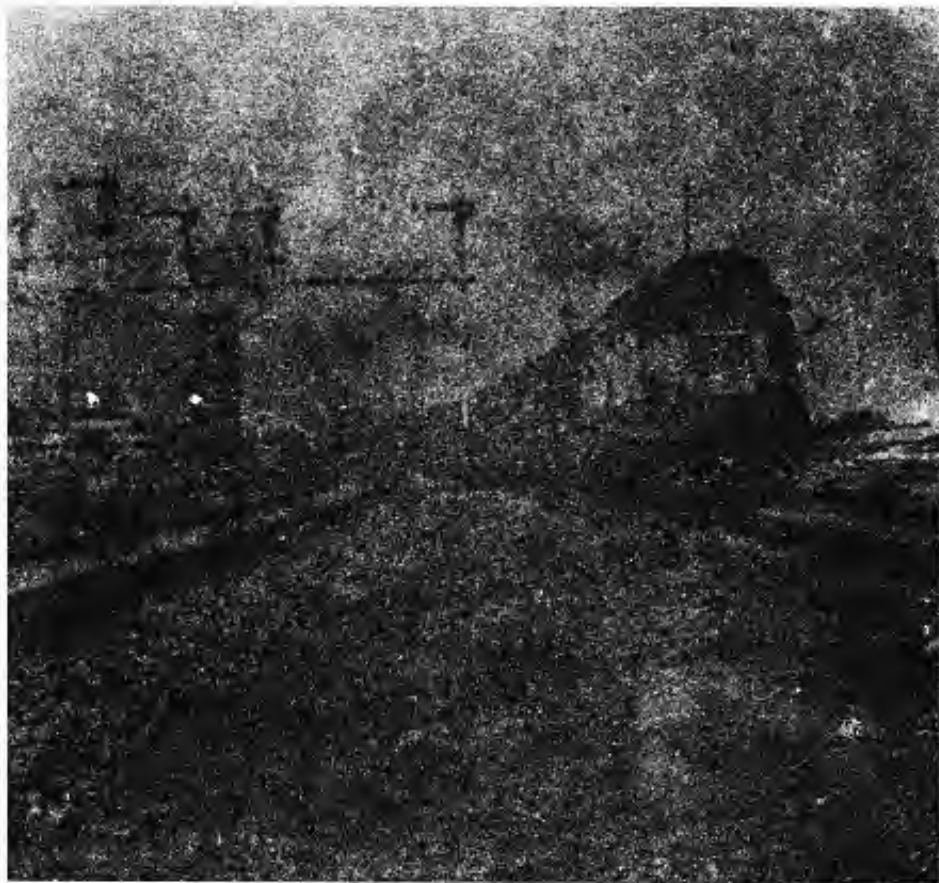
The Absolute Block System of train operation, which has been described earlier, provides an example of the safety regulations on the railways. Here, the rule is : on one stretch of track between any two stations, one train. No stretch of track between two adjacent stations is allowed to hold more than one train at a time. For a train to leave station A towards station B, it must have received specific permission from B, called "line clear": Similarly, a train can leave B *if and only if* it has had "line clear" from the next station. "Line clear" is the assurance that the line



between the stations is clear as well as that the permission to approach the next station has been granted. The responsibility for giving this permission lies with the station-master of the station receiving the train.

A similar set of safety regulations governs the approach of the train to a station. Suppose B is a two-line station. Having granted "line clear" to station A to despatch a train, station B has to take quite elaborate precautions while allowing it to enter the station. The approach to the station is governed by a group of approach signals and its departure from the station is governed by a set of despatch signals. The train-driver has to obey each of these signals. By manipulating the signals at his station, the station-master can tell the driver exactly what he wants the train to do. If he wants the train to run through his station without slowing down *and* if his main line is clear of all obstructions, he will lower all the approach and despatch signals to give the train what is called a "run through". But he may want the train to stop at the station, in which case, he will only lower one of the approach signals but keep the despatch signals at danger.

When lowering any signal at a station, the main safety precaution is to see that the railway line is clear not only up to the next signal but also for a certain distance beyond. For example, if a station has four approach and despatch signals, S_1 , S_2 , S_3 and S_4 , signal S_1 can be lowered only if the line is clear not only between S_1 and S_2 but also between S_2 and S_3 . The distance between S_2 and



S_2 is called the "adequate distance beyond".

The object of such a safety margin is to ensure that there are always at least *two* signals between a train and any obstacle. If there is something on the track between S_2 and S_1 , then S_1 will always be at danger as well as S_2 . For, suppose we lower S_1 merely because the line is clear

up to S_1 . After all, the driver is expected to stop at S_2 , which is kept at danger because the obstruction lies just ahead of it. If he does so, as he should, all is fine. But if he fails to stop at S_1 even though it is at danger, the train will have an accident. This is why even S_1 cannot be lowered although the obstruction lies beyond the next signal S_2 . For greater safety, railway rules require that S_1 cannot be lowered unless the line is clear not only up to the next signal S_2 but right up to S_3 . This is a built-in safeguard against what is called in official publications on railway safety "human failure".

Some foreign specialists have criticized this extra margin of safety on the Indian Railways. They say that since the driver is committed to stop at S_2 if the signal is at danger, why put S_1 at danger as well? The answer is that we cannot yet rely upon an individual to obey all the safety regulations that he should. In technologically more advanced countries, people have been conditioned to obey a set of technical rules implicitly. They have had more time to learn that if everyone obeys implicitly the set of rules given to him in his job, society as a whole will benefit. Technological progress of a society can only occur if each member of it can be trusted to fulfil his commitments. In our country what happens at the moment is that we always require a second man to check the first man's job!

If only the Indian Railways did not need to provide these extra margins of safety, it would produce a service even safer and cheaper than it actually is.

Table II shows how safe and cheap the Indian Railways

are compared with other countries. The first column shows how many accidents there are for every million km travelled by trains. The second column gives the average passenger fare over one kilometre. And the third gives the average cost of transporting one tonne of freight one kilometre. Thus, compared with the British Railways, the passenger and freight charges on the Indian Railways are about three to four times less, while the incidence of accidents is twice as great.

TABLE II

	<i>Index of accident incidence</i>	<i>Index of pas- senger fares</i>	<i>Index of goods freight</i>
	<i>Incidence of collisions & derail- ments per million train km</i>	<i>Average fare per passenger km in paise</i>	<i>Average freight per tonne-kilo- metre in paise</i>
1. Indian Railways	3.11	4.48 (1981-82)	13.70
2. Japanese National Railways	1.30	44.18 (1981)	33.13
3. Canadian Pacific Railways	5.77	43.57 (1981)	13.61
4. German Federal Railways	1.95	76.36 (1981)	55.65
5. French National Railways	0.73	45.71 (1981)	37.94
6. British Railways	1.03	55.77 (1981)	49.01
7. U.S. Class I Rail Roads	—	36.27 (1980)	16.74

RAILWAY ORGANISATION

If you are not a railwayman's next of kin, your contact with the railways will be intermittent, short and (hopefully) sweet. It may occur when you buy your ticket at a booking-window, or when you board a train to go on a pilgrimage, or when you visit a parcel office to collect your basket of fruit, or when you claim a refund for a journey you did not make. How is it that there is always someone to meet your demands? Or if not, as sometimes happens, how is it that there is always someone to hear your complaint and rectify the omission? The short answer is the railways' behind-the-scenes organisation of men.

Railway organisation is like the functioning of the body. The body has various organs, like the brain, the heart, the lungs, the stomach, etc., each of which performs a special function which helps to keep you alive. The railways too have organs like the body, each of which performs its own specialized function which helps to keep the railways going. (When you inquire about the timings of trains, for instance, you are coming into contact with only

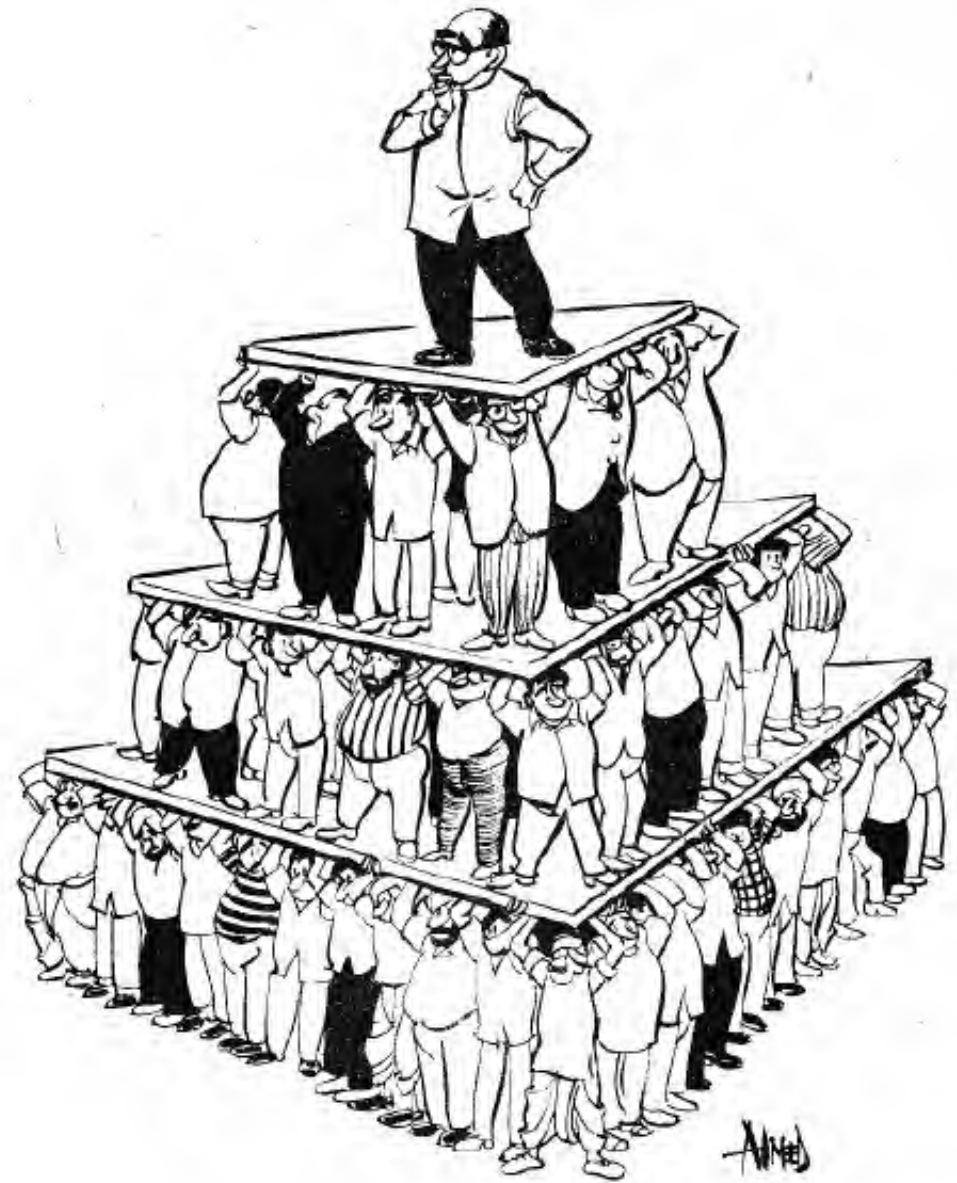
one organ of the railways.) Railway organisation is the way its functional organs are tied together.

There are many different organs within the railways, but each is built in the same kind of way. Each organ has the same structure. This is the structure of a pyramid, with a single point at the top broadening down to a wide base at the bottom. When you have a body of men, say 1000, at the base, whose work is supervised by 100 men, whose work in turn is directed by another layer of 10 men, whose work again is guided by a single man at the apex, you have, figuratively speaking, a pyramid. The base of 1000 men tapers to the top boss through two intermediate layers of 100 men and 10 men. Such a unit is the organisational pyramid.

On the railways the basic organ of work is the station. Station organisation is structured like a pyramid. At the top comes the station-master and at the bottom the various ground workers, like the pointsman who changes the points, the lampman who lights the signal lamps, and the booking-clerk who sells tickets.

The main function of the station is to meet the demands of the general public who use the railways. But besides a station, there are other railway organs with different functions. Such are the loco sheds, carriage and wagon depots, and the engineering and signal workshops. These perform specialised functions for the railways' own internal service. For instance, the signal workshops function for the repair and maintenance of signals.

Organs like the stations, loco sheds and depots are mainly



meant for local use. But within a particular region, a number of such local organs are linked together to form the base of a larger pyramid, the divisional pyramid. The base of the divisional pyramid consists of all the stations, workshops, wagon depots, etc., throughout the region. The divisional pyramid tapers through two or three successive layers to its own top, the divisional superintendent. The divisional superintendent is in charge of the whole division.

Again, a number of divisions form the base of the zonal pyramid, which tapers in turn to its top, the general manager.

A Railway Workshop



There are nine such zonal pyramids making up the Indian Railways. Table III below lists some of their salient features.

TABLE III
Salient Features of Zonal Railway Organisations

<i>Railway</i>	<i>Head-quarters</i>	<i>Route Kilo-metres</i>	<i>No. of Divisions and their headquarters</i>	<i>No. of employees</i>
(1)	(2)	(3)	(4)	(5)
Central	Bombay	6679	5—Bhusaval, Bombay, Jhansi, Jabalpur and Nagpur	200802
Eastern	Calcutta	4197	5—Asansol, Danapur, Howrah, Sealdah and Dhanbad	214749
Northern	Delhi	10781	7—Allahabad, Bikaner, Ferozepur, Jodhpur, Lucknow, Moradabad and Delhi	218593
North Eastern	Gorakhpur	5104	4—Samastipur, Izzatnagar, Lucknow and Varanasi	98638
North-East Frontier	Maligaon (Pandu)	3628	4—Katihar, Alipurduar, Lumding and Tinsukia	85928
Southern	Madras	6489	6—Guntakal, Mysore, Madras, Olvakkot, Tiruchirapalli and Madurai	124871
South Central	Secunderabad	6479	4—Vijayawada, Secunderabad, Hubli and Sholapur	113352
South Eastern	Calcutta	5999	7—Nagpur, Bilaspur, Chakradharpur, Kharagpur, Adra, Khurda Road and Waltair	195787
Western	Bombay	10337	8—Bombay, Baroda, Ratlam, Kota, Ajmer, Jaipur, Rajkot and Bhavnagar	193765
TOTAL		60,693		1,446,485

However, the nine zonal railways do not exhaust the full organisation of the Indian Railways. There are two other large organs which serve all the nine zones. One is

the Research and Designs and Standards Organisation (R.D.S.O. for short), where research is carried on. The other is the organisation which manufactures locos and carriages.

The three essential pieces of equipment of the railways are locos, carriages and wagons. Of these, private industry is only able to supply one, the wagons. The other two, locos and carriages, have to be manufactured by the railways themselves. To do so, the railways have set up two plants, one at Chittaranjan and the other at Varanasi. The former, named Chittaranjan Locomotive Works, produces electric and steam locos. The latter, the Diesel Locomotive Works, Varanasi, produces diesel locos. Railway carriages are manufactured by the Integral Coach Factory at Madras. The salient features of the three plants, or production units, are shown in Table IV below.

TABLE IV

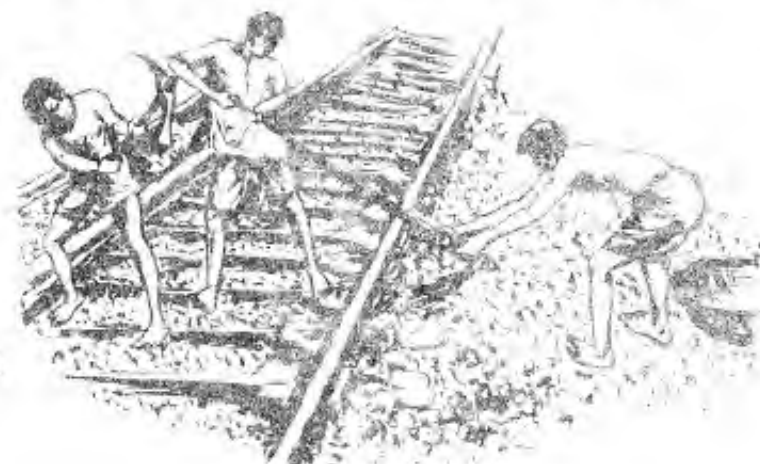
<i>Production unit</i>	<i>Production started in</i>	<i>Units produced in 1981-82</i>	<i>No. of employees</i>
Chittaranjan Locomotive Works	November 1950	Electric locos (AC) 50 Diesels 32	16,114
Integral Coach Factory, Madras	October 1955	Passenger coaches 730	14,549
Diesel Locomotive Works, Varanasi	January 1964	Diesel locos 137	8,022

Each of these production units has its own pyramidal structure. At the base of the pyramid are the workers

on the shop floor, while at the top there is the lone general manager. Lone, because at the top there is room only for one.

The Research and Designs and Standards Organisation is the place where research in railways is carried on. This organisation was set up by the railways to bridge the technology gap spoken of earlier. In order to bridge the gap, the research men have to keep abreast of advances in technology all over the world. The R.D.S.O., therefore, faces the hardest and most challenging task.

If you build a pyramid with the heads of the nine zonal railways, three production units and the R.D.S.O., as the base and with the Union Cabinet Minister for Railways at the apex, you have the last pyramid that completes the railway organisation. The Railway Minister is aided by a Minister of State and a Deputy Minister. He is responsible to Parliament for the overall administration and management of our railways. He discharges this responsibility through the Railway Board. The Railway Board functions as the top railway executive for administrative and technical supervision of the railways.



GLAMOUR ON RAILWAYS

You will recall that the railways' daily bread is not passenger transport but goods traffic. Yet they need glamour to win popularity. This they do by providing luxury travel facilities to their passengers on some trains. Fifty years ago in the heyday of the railways, some trains had luxurious cars—the celebrated Pullman coaches—which became the ultimate in travel hospitality. Their designer, George Pullman, achieved international renown and today in the dictionaries of twenty languages throughout the world, the word "Pullman" appears as a noun connoting luxury, comfort and safety in overland transportation.

However, the world of fashion and luxury changes. The kind of passenger service Pullman provided became obsolete with the onset of the jet age. It was, no doubt, in tune with the slow-moving railway age where leisure was abundant and people travelled mainly for pleasure or pilgrimage. But today the traveller is in a hurry to reach his destination. So some railways in the affluent countries have now begun to seek glamour by an accent on speed in

addition to comfort and luxury. Despite the heavy initial costs, they have introduced ultrafast trains in a bid to rival air travel.

The foremost amongst these seekers of glamour through speed are the Japanese Railways with their Hikari Express, nicknamed the bullet train, the fastest in the world. The bullets run on the New Tokaido line at a maximum speed of 210 km. p.h., covering a distance of 515 km between Tokyo and Osaka in 3 hours and 10 minutes. They are clean, comfortable and pressurised so that your ears do not pop in the tunnels.

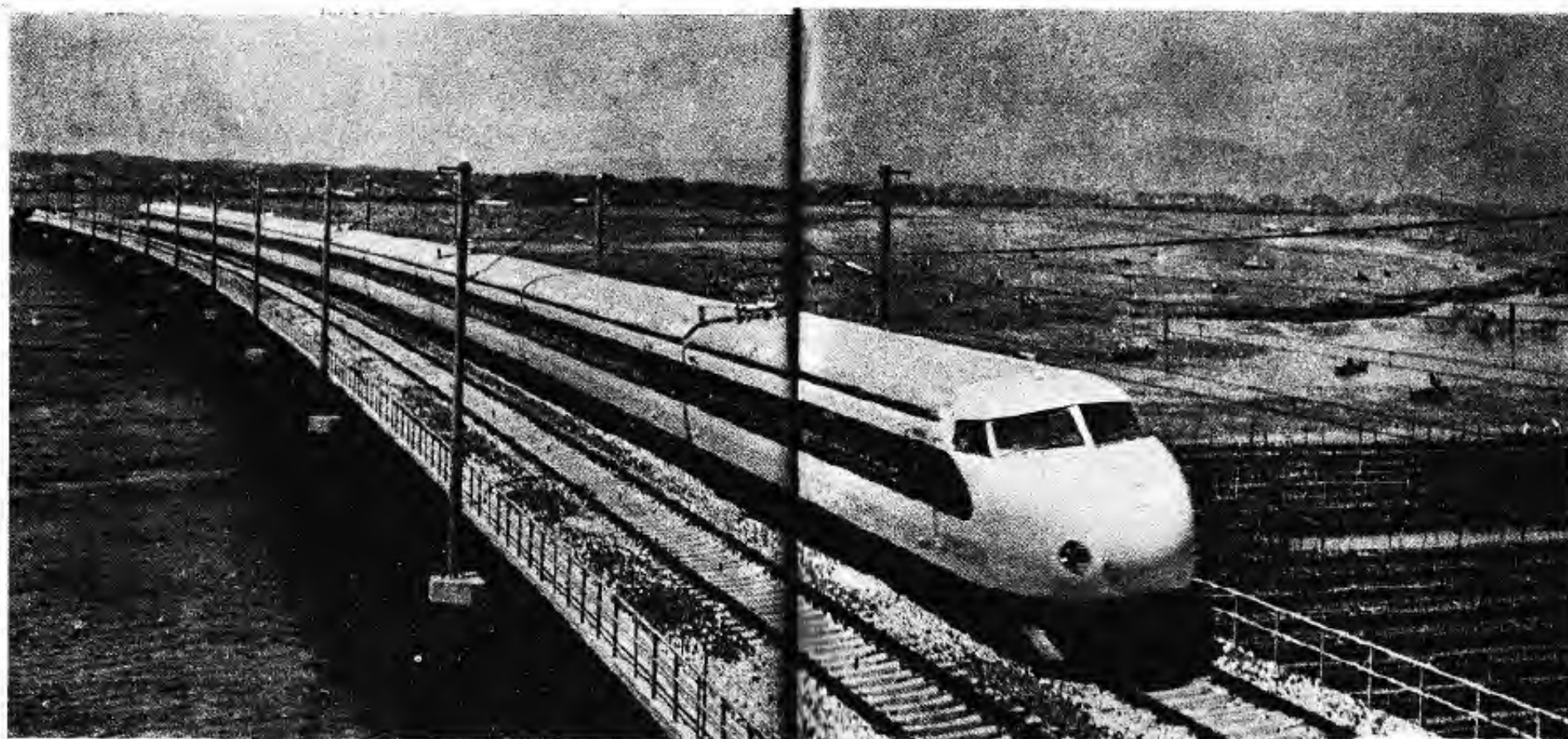
The New Tokaido line was built from scratch with a new track fit for high-speed traffic, special types of trains and the latest signalling and train control techniques. This, however, was achieved at a tremendous cost. The Japanese National Railways spent Rs. 675 crores on a route barely 515 kilometres long. This works out to Rs. 1.3 crores per route kilometre. In comparison, the Indian Railways cost Rs. 6,000 crores for a total route kilometrage of about 60,000. The average capital cost per route kilometre on the Indian Railways is thus only Rs. 10 lakhs. In other words, the initial cost per route kilometre on the New Tokaido line was *13 times* as much as that on the Indian Railways.

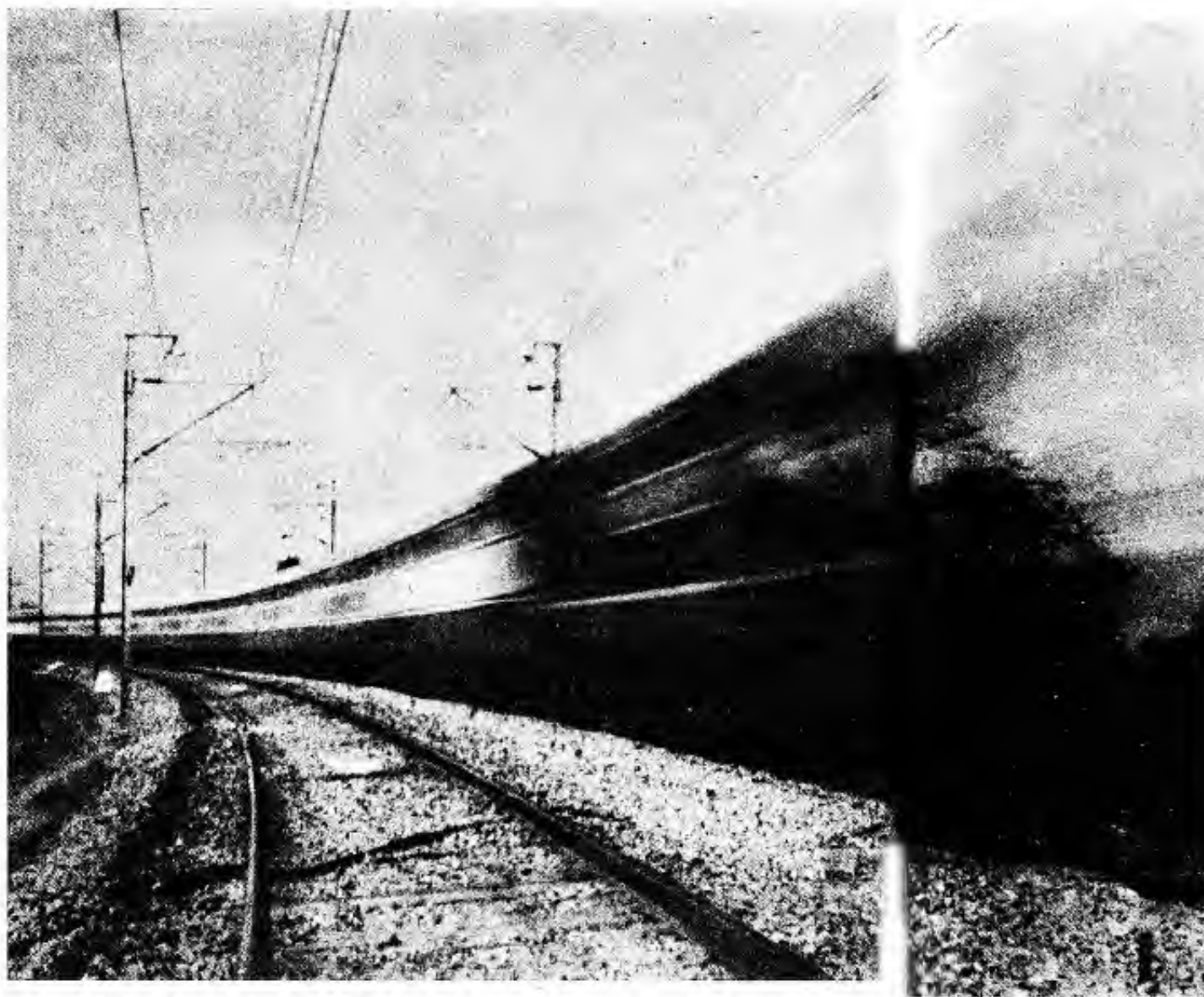
The Indian Railways with their limited finances cannot afford to emulate the Hikari Express. But using the existing equipment and at little additional cost they have managed to make a break-through and achieve speeds which were undreamt of when the first railway line was opened.

The movement to improve track by better maintenance without incurring *any* additional cost whatsoever began for the first time on the South Eastern Railway in 1967. Within a year the railways' main-line section, Howrah to Nagpur, was strengthened sufficiently to break the speed barrier of 100 km. p.h., which had hitherto been believed to be the ultimate speed which the broad-gauge track could bear. It enabled the South Eastern Railway to run in

February, 1968, the first ever ultrafast trial trains on the Indian Railways. These trial trains ran at a maximum speed of 128 km. p.h., completing the whole run of 1,131 kilometres from Nagpur to Howrah in 12.50 hours against over 24 hours taken by the Bombay Mail, the fastest regular train on the section. These trials showed for the first time that the main line track on the broad gauge could be made fit, at practically no cost, for speeds exceeding 100 km. p.h.

World's fastest train—Hikari Express



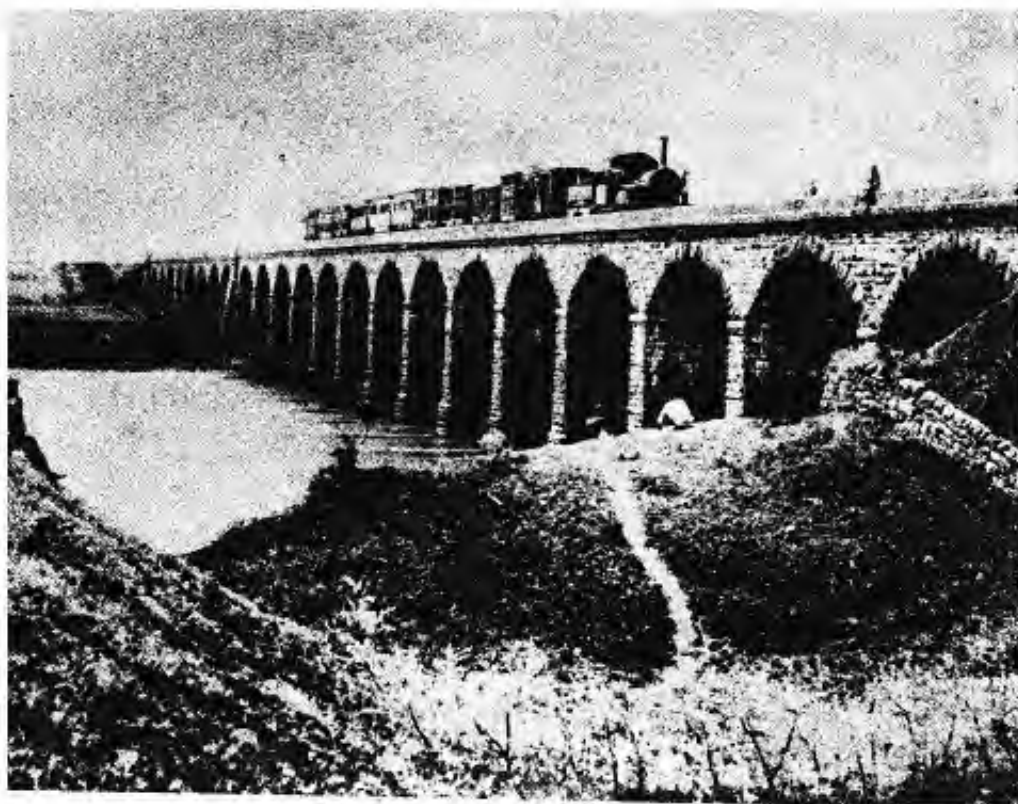


Rajdhani Express

It was in the wake of this experience that steps were taken to strengthen the track between Howrah and Delhi in order to introduce an ultrafast train—the Rajdhani Express—on this important route. This de luxe service was introduced on March 1, 1969.

The Rajdhani Express operates at the moderately high speed of 120 km. p.h., covering a distance of 1,475 kilometres in 17 hours and 20 minutes, resulting in a saving of six hours in the transit time between the two metropolitan cities. With no capital investment on signaling and track, the Indian Railways have achieved an increase of 20 per cent in their speeds, thereby breaking the century-old barrier of "100 km. p.h."

The first railway train in India took passengers for a 32-kilometre ride from Bori Bunder (Bombay) to Thana on April 16, 1853. Since then the Indian Railways have become



The first train in India

the country's largest nationalised undertaking. Railways are not merely a convenient form of transport, criss-crossing the country with a network that takes travellers to the remotest parts of India, they have also made an invaluable contribution to economic growth and are the biggest single employer in the country.

TWO PESTS OF OUR TIME

On most of the trunk routes of our railways, there is a continual traffic of goods and passenger trains, day and night. Many of these routes, like the Grand Chord section of the Eastern Railway, carry as much traffic as is possible. They are working to saturation capacity. Any system that is working to capacity is likely to be thrown off balance by even a minute outside disturbance. In such cases small causes can lead, not to small effects, but to almost catastrophic consequences. The reason is that a slight disturbance in a tightly stretched system sparks off a chain reaction that can snowball into a disaster.

You have probably heard of the old parable lamenting the loss of a kingdom for want of a nail :

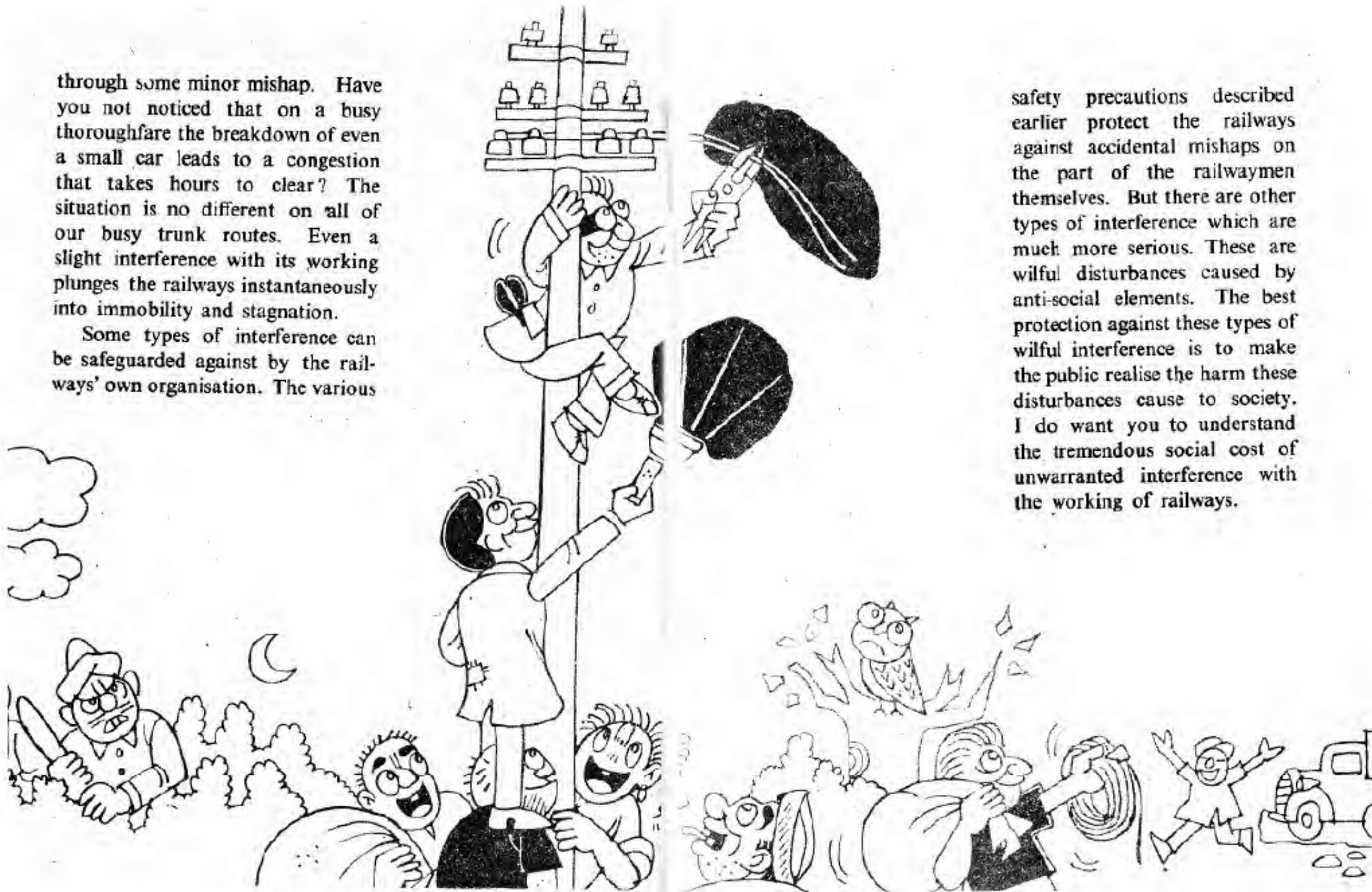
*"For want of a nail a horse was lost,
For want of a horse, a rider was lost,
For want of a rider, the battle was lost,
For want of a battle, the kingdom was lost,
And all was lost for want of a nail."*

Such figurative kingdoms are being lost almost every day

through some minor mishap. Have you not noticed that on a busy thoroughfare the breakdown of even a small car leads to a congestion that takes hours to clear? The situation is no different on all of our busy trunk routes. Even a slight interference with its working plunges the railways instantaneously into immobility and stagnation.

Some types of interference can be safeguarded against by the railways' own organisation. The various

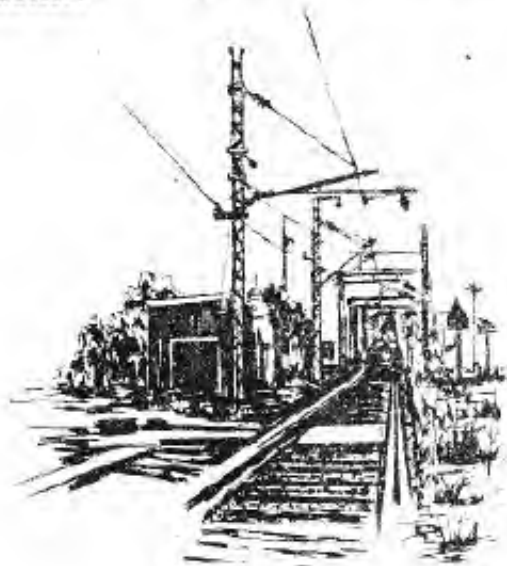
safety precautions described earlier protect the railways against accidental mishaps on the part of the railwaymen themselves. But there are other types of interference which are much more serious. These are wilful disturbances caused by anti-social elements. The best protection against these types of wilful interference is to make the public realise the harm these disturbances cause to society. I do want you to understand the tremendous social cost of unwarranted interference with the working of railways.



or alarm-chain-puller, who puts himself above society. Mr Predator is the thief who steals railway equipment for himself. The gains of Mr Parasite and Mr Predator have to be paid for by society. Society pays for them dearly by the added cost of railway service, which would otherwise be far cheaper than it actually is. In other words, Mr Parasite and Mr Predator try to flourish at the expense of the community (which includes you and me).

If you consult any modern dictionary for the meaning of pest, you will find that it means an animal that flourishes at the expense of his environment, and accordingly becomes a nuisance or a menace to others. Mr Parasite and Mr Predator try to flourish at the expense of society, and are therefore nothing more than pests.

Now that you realise what a scourge these people are, I do hope you will spread this knowledge far and wide. Only if each member of the public does his best to stop such interference will the railways become cheaper and the country better.



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